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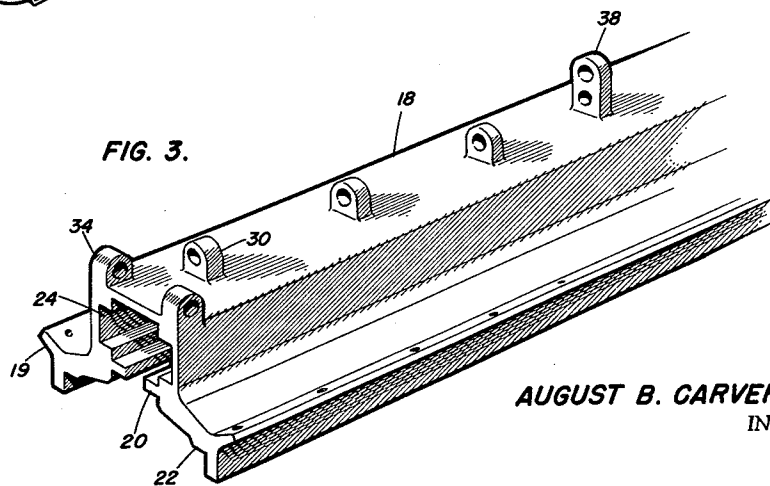
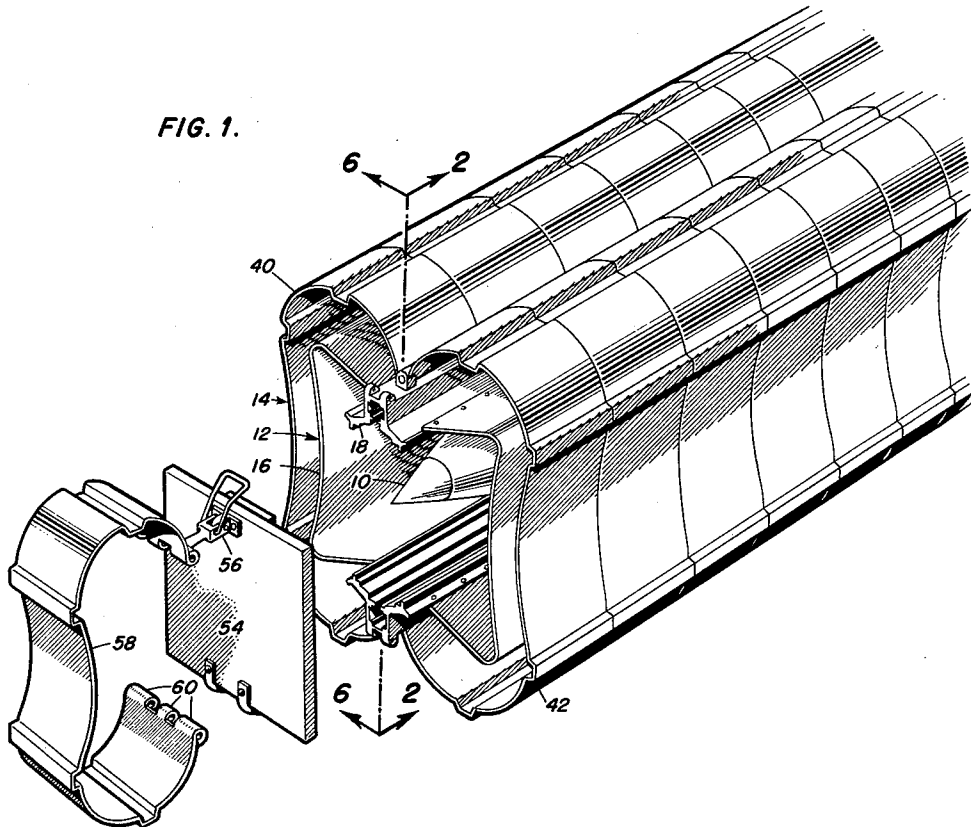
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2,903,124

MISSILE PROTECTIVE PACKAGE

Filed June 4, 1958

3 Sheets-Sheet 1



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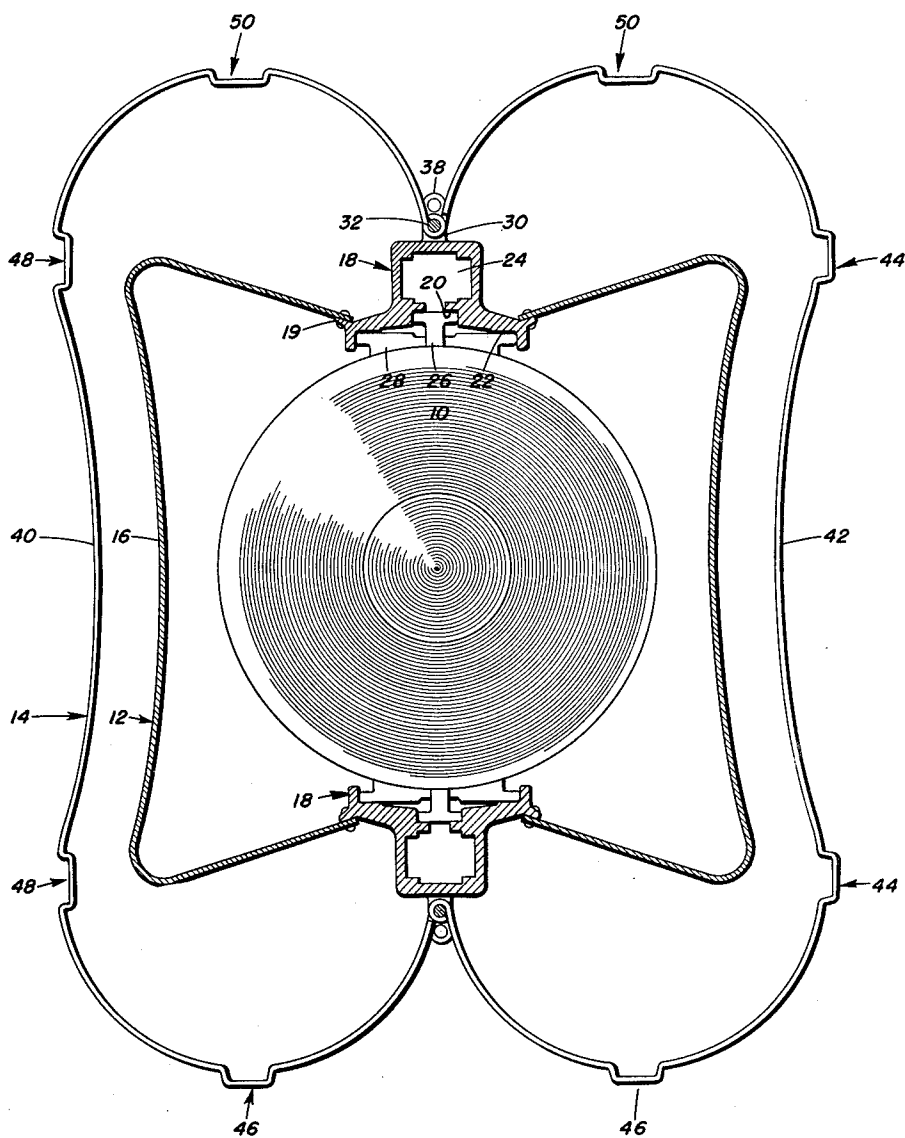
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FIG. 2.



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FIG. 4.

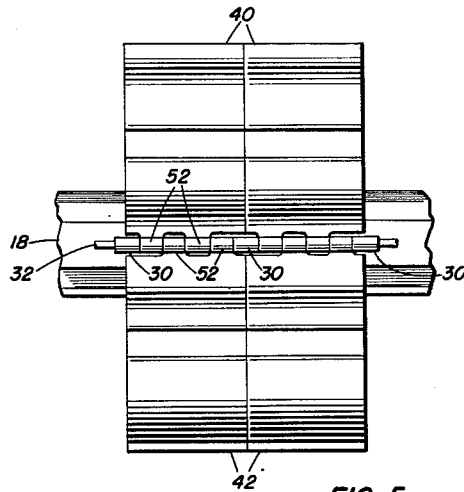
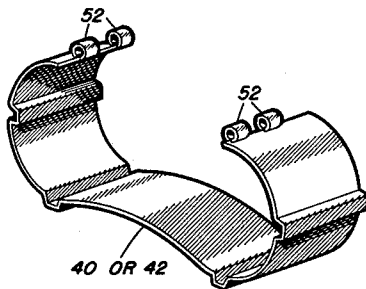


FIG. 5.

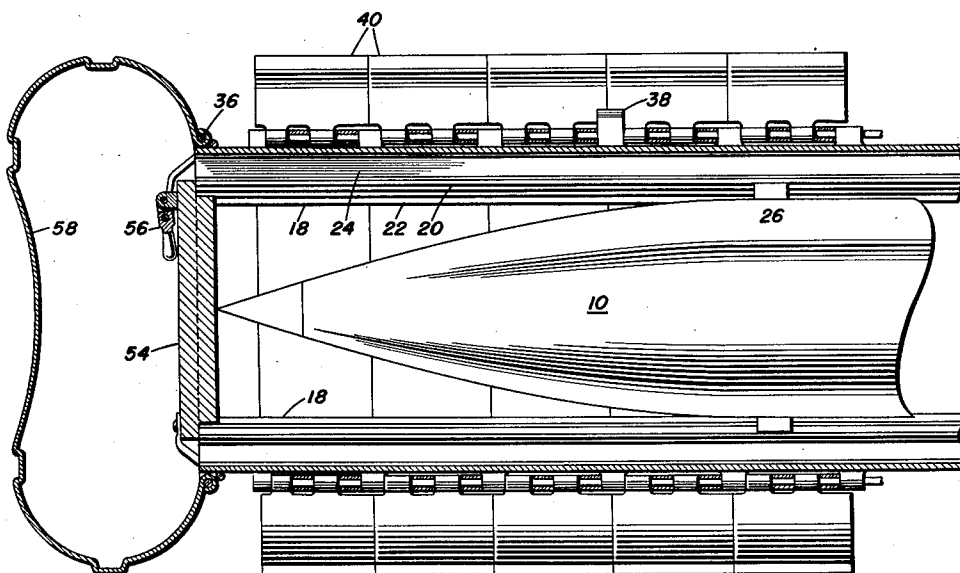


FIG. 6.

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MISSILE PROTECTIVE PACKAGE

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7 Claims. (Cl. 206—3)

This invention relates generally to packaging devices, and more particularly to a protective packaging arrangement which will provide protection for an object, such as a missile, from adverse shock and vibrational forces during shipping and handling thereof.

Certain articles, such as aerial missiles, must receive a maximum amount of protection during shipping and handling operations, and yet the protection afforded must be without impairment to the ease and facility of handling the articles. Conventional means for providing shock and vibration resistant packaging are usually bulky, difficult to handle, non-reclaimable, and require appreciable expenditure of time and effort for uncrating operations.

It is therefore an object of the present invention to provide a protective packaging arrangement which will tend to minimize adverse effects of shock and vibration on the enclosed article which may be encountered in handling or shipping operations.

Another object of this invention is to provide a protective packaging arrangement which is compact and easily handled.

An additional object of this invention is to provide a protective container that is reusable and capable of being broken down into small components for easy reshipment.

Still another object of this invention is to provide a protective packaging arrangement which permits the enclosed article to be quickly and easily unpacked.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of the protective packaging arrangement constituting the present invention;

Fig. 2 is an enlarged cross section on line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail perspective view of a rail of Fig. 1;

Fig. 4 is an enlarged perspective view of a spring section of Fig. 1;

Fig. 5 is a plan view of a portion of the package arrangement of Fig. 1 showing details of the hinge connection of the suspension spring sections with the rail; and

Fig. 6 is a partial longitudinal section on line 6—6 of Fig. 1 showing the arrangement of the end cover and the end spring sections.

Briefly, the present invention contemplates a packaging arrangement wherein an inner container is enclosed by an outer container. The outer container includes a plurality of C-shaped suspension spring sections which are so arranged and connected to the inner container as to resiliently suspend and form a protective shell about the inner container.

Referring now to the drawings in greater detail, Fig. 1 illustrates a missile 10 encased by an inner and an outer container 12 and 14, respectively. The inner container 12 completely encloses the missile 10 and includes a pair

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of U-shaped walls 16 fastened together at the top and bottom by rails 18.

The rails 18 are preferably of one piece construction and extend slightly beyond each end of the missile 10. As best seen in Figs. 2 and 3, three longitudinal slots 20, 22 and 24 are formed in each of the rails 18 and extend the full length thereof, the slots 20 and 22 being respectively provided for receiving the front shoes 26 and the rear shoes 28 of the missile 10. Shoes 26 and 28 are customarily employed to suspend the missile from a launching rail. Slot 24 is provided for receiving a ramming chain (not shown) which is used in loading the missile 11 into a launcher magazine (not shown) in preparation for launching operations.

For the purpose of providing connection of the rails 18 with the walls 16, flanges 19 are formed on the rails and are secured to the walls by rivets, screws, welds or other suitable means. As previously mentioned, the walls are of a U-shaped cross section and extend the full length of the missile 10.

As best seen in Fig. 3, a series of hinge eyes 30, having a common axis, are spaced at regular intervals along the longitudinal center line of each rail 18. A pair of hinge eyes 34 are also provided transversely to the axis of hinge eyes 30 of the rail 18. Suitable ones of the hinge eyes 30 may be extended and bored to provide lifting lugs, as at 38.

Referring now to Figs. 1 and 2, the outer container 14 may be seen to comprise a plurality of independent curved spring sections 40 and 42, which are fastened to the inner container 12 by hinge pins 32 driven through the hinge eyes 30.

As best seen in Fig. 2 and Fig. 4, the spring sections 40 and 42 are substantially C-shaped, each having an inwardly bowed central portion so that in the normal secured position about the inner container 20, a double tangent surface is formed about each of the four sides of the inner container with points of tangency at 44, 46, 48 and 50. Along each of these points of tangency are formed stacking grooves, spring section 40 having continuous female stacking grooves at points 48 and 50, and a continuous male stacking groove at point 46. Spring section 42 is provided with continuous male stacking grooves at points 44 and 46, and a continuous female stacking groove at point 50. The ends of the spring sections 40 and 42 each terminate in two hinge eyes 52 which together mate with hinge eyes 30 of the rails 18. Fig. 5 best illustrates the manner by which pin 32 secures the spring sections 40 and 42 to the rails 18.

Removable end covers 54, shown in Figs. 1 and 6, are provided to close the ends of the inner container 12 and may be fastened by a latch 56. Spring sections 58, which are similar to spring sections 40 and 42, are mounted over each end of the inner container 12 by engagement of hinge eyes 60 with rail hinge eyes 34 and are secured in place by hinge pins 36.

For the purpose of preventing longitudinal shifting of the missile 10 within the inner container 12, a retaining pin is inserted in an aperture in the rail 18 that is in register with an appropriate aperture in the shoes 26 or 28.

When the protective packaging arrangement is completely assembled, it is seen that the inner container 12, having the missile 10 therein, is encased by a protective shell formed of a plurality of spring sections 40, 42 and 48. In addition to providing an effective shield for the inner container 12 against incidental blows, these spring sections of the outer container 14 also actually suspend the inner container within a resilient structure to provide cushioning against the effects of any vibrational or impact forces which may be imposed upon the entire assembly. It is this latter characteristic, the ability for

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high energy absorption, that renders the invention herein described extremely valuable for use as a packaging arrangement for articles which must receive a high degree of protection from shock and vibration. Furthermore, necessary protection is provided without sacrifice of handling ease or compactness. Also, each assembly may be stacked along with similar containers, in orderly piles by using the stacking grooves provided.

If it is desired to unpack the container, or if it is determined that the maximum protection offered by the complete arrangement is in excess of that actually required, the outer container 14 may be quickly removed by merely withdrawing the hinge pins 32 and 36. This will result in the dropping off or "unshelling" of the individual spring sections 40, 42 and 58 leaving the inner container 12 to protect against the anticipated decreased shock and vibration conditions. If complete unpacking is desired, all that remains to be done is the withdrawal of the retaining pin and the removal of the missile 18, from the inner container 12. The "unshelling" operation is best accomplished when the entire assembly is suspended by an appropriate sling and hoist utilizing the lifting eyes 38.

Once the spring sections 40, 42 and 72 have been removed, they can easily be gathered up and packed tightly together into a small container for return to the original shipping point for reuse. These spring sections which make up the outer container 14 can be used repeatedly, the only limitation being the failure or permanent deformation thereof.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A protective packaging arrangement, comprising, structure defining a container, a plurality of hinge eyes positioned on the outside walls of said container, a plurality of companion C-shaped springs surrounding said container and having a second plurality of hinge eyes terminating each leg thereof, said second plurality of hinge eyes being engageable with said first plurality of hinge eyes, and a retractable hinge pin engageable with said first and second pluralities of hinge eyes to secure said springs in locked relationship with said container to enable said springs to suspend resiliently said contain-

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er, each of said C-shaped springs having an inwardly bowed back to form a double tangent outer surface thereon, whereby said protective packaging arrangement is provided with exterior surfaces having at least two points of tangency on each surface.

2. The arrangement recited in claim 1, with additionally a stacking groove at each point of tangency.

3. A protective packaging arrangement for protecting an article from shock and vibration, comprising, an inner container, a member in each of a pair of opposing longitudinal walls of said inner container and coextensive with said walls, a plurality of grooves in each of said members and communicating with the inside of said inner container, said grooves being engageable with said article, releasable attaching means on each of said members and communicable with the outside of said inner container, an outer container including a plurality of curved companion suspension springs surrounding said inner container, means on each of said springs and engageable with said attaching means, the ends of each of said springs being releasably attached to said attaching means on opposite walls of said inner container, whereby said plurality of springs support said inner container in resilient suspension and simultaneously form a protective outer shell about said inner container.

4. The apparatus as recited in claim 3 wherein said releasable attaching means includes a plurality of hinge eyes and a plurality of retractable hinge pins engageable with said hinge eyes.

5. The apparatus as recited in claim 3 wherein said curved companion suspension springs comprise C-shaped springs.

6. The apparatus as recited in claim 5 wherein said C-shaped springs are each provided with an inwardly bowed back to form a double tangent outer surface thereon, whereby said packaging arrangement is provided with an exterior having at least two points of tangency on each side.

7. The apparatus as recited in claim 6 with additionally a stacking groove at each point of tangency.

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